REMARKS

In an Office Action dated July 28, 2005, claims 1-8 were rejected. Claims 9-30 were withdrawn as being drawn to nonelected inventions. In the present response claim 1-7 are amended and new claims 31-32 are submitted. In view of the above amendments and the following remarks, Applicants respectfully request reconsideration of the application, and allowance of the pending claims, as amended.

The present application relates to isolated DNA molecules that encode a novel NADH dependent L-xylulose reductase, which utilizes carbohydrates present in industrial waste to produce useful products. The DNA molecules find use in the preparation of transgenic microorganisms which express the novel reductase. In this response Applicants have amended the pending claims to conform more closely to U.S. practice.

REJECTIONS UNDER 35 U.S.C. §112, SECOND PARAGRAPH

In the Office Action, claims 1-8 were rejected under the second paragraph of 35 U.S.C. § 112, as being indefinite. It was asserted that the term "characterised in that" made the claims unclear. In this response claims 1-7 have been amended to remove each indicated occurrence of this term. In view thereof, Applicants respectfully ask that the rejection of claims 1-8 as being indefinite based on the term "characterised in that" be withdrawn.

Claims 3 and 6 were rejected under the second paragraph of 35 U.S.C. § 112 as being indefinite in that the term "functionally equivalent derivatives" was asserted to be unclear. Applicants respectfully traverse this rejection.

The small sequence variations which provide proteins having the novel characteristics of the NADH dependent L-xylulose reductase that are the "functionally equivalent derivatives" of the present application are described at paragraphs [031]–[032] and [049] of the present application. Moreover, it is well known to those of skill in the art that the amino acid sequence of a particular protein may be encoded by many nucleic acid sequences due to the degeneracy of the genetic code. The code defines the functional relationship between nucleic acid sequences and the amino acid sequences of the proteins they encode. Once the amino acid sequence of a protein is known, the skilled worker can readily derive any of the sequences that encode the protein.

The skilled person also understands how to vary the amino acid sequence of a known protein by making conservative substitutions of amino acids within the sequence that do not change the functional properties of that protein or enzyme. Such changes require only routine experimentation.

Thus, one of skill in the relevant art would readily understand that the functionally equivalent derivatives of the isolated DNAs of claims 3 and 6 are isolated DNA molecules that encode proteins having the characteristics of the novel NADH dependent L-xylulose reductase of the present application, but which may differ in sequence from precise nucleic acid and amino acid sequences of SEQ ID Nos. 1 and 2. Applicants respectfully assert that claims 3 and 6 are not indefinite and ask that the rejection of these claims under the second paragraph of 35 U.S.C. § 112 be withdrawn.

REJECTION UNDER 35 USC § 102(A)

Claims 1-3 and 6-8 are rejected under 35 USC § 102(a) as being anticipated by Ishikura et al. (*Chemico-Biological Interactions* (2001) *130-132*, pp. 879-889.) Ishikura et al. report the cloning and expression of a diacetyl reductase from hamster, which they conclude is identical to L-xylulose reductase of hamster. Applicants respectfully traverse this rejection.

It is well known to those of skill in biochemistry that the source of available reducing power for enzymes such as reductases in living cells is the cofactor NADPH. Unlike the NADPH dependent xylulose reductases known in the prior art, the enzyme encoded by the isolated DNA of the present application is an NADH dependent reductase. See paragraphs [069]-[070] of the present application.

To anticipate, a prior art reference must disclose each element of the claimed invention. Because Ishikura does not disclose a NADH dependent L-xylulose reductase, it does not anticipate the claims of the present application. Applicants respectfully ask that the rejection of claims 1-3 and 6-8 as being anticipated by Ishikura et al. be withdrawn.

REJECTION UNDER 35 USC § 103(A)

Claims 1-8 are rejected under 35 USC § 103 (a) as being obvious over Ishikura, in view of Dien et al. (*Applied Biochemistry and Biotechnology* (1996) *57/58*, pp. 223-240.) It is asserted that it would have been obvious to use the methods of Ishikura et al. with the yeast strains identified by Dien et al. to isolate the L-xylulose reductase enzyme of the present application. It is further asserted that one of skill would first separate genetic material from the yeast, which would meet the

limitations of claims 1-7, and that adherence to the methodologies of Ishikura et al. would result in the identification recombinant production of various yeast enzymes involved in pentose metabolism. Applicants respectfully traverse this rejection.

A claimed invention is obvious only if "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." 35 U.S.C. § 103(a). Nothing in Ishikura et al. and Dien et al. taken either alone, or in combination, discloses the isolated DNA encoding the novel NADH dependent L-xylulose reductase of the present claims. Thus, the present claims are not obvious in view of the cited references.

As discussed above, Ishikura et al. does not teach the novel NADH dependent L-xylulose enzyme of the present application, nor does it teach an isolated DNA that encodes that enzyme. Ishikura et al. only reports the cloning and expression of a diacetyl reductase from hamster, which the authors conclude is identical to L-xylulose reductase of hamster based on a comparison of certain characteristics of the enzyme. Dien et al. report the identification of eleven strains of yeast which were determined to be capable of fermenting L-arabinose to ethanol in low quantities. Neither Ishikura et al., nor Dien et al., disclose or suggest the isolated DNA encoding the novel NADH dependent L-xylulose reductase of the present application.

Absent knowledge of the novel enzyme provided by Applicant's present application, one of skill in the relevant art would not be motivated to isolate chromosomal DNA from any organism, including the yeast identified by Dien et al.,

or to identify and isolate a DNA molecule encoding the novel enzyme that is the subject matter of the present application. Moreover, application of the methods of Ishikura et al. to the strains of yeast identified by Dien et al. is nothing more than hindsight reconstruction of the subject matter of the present claim. That hindsight reconstruction is only possible when one has knowledge of the teachings of the present application. Thus, Applicants respectfully ask that the rejection of claims 1-8 as being obvious over Ishikura et al. in view of Dien et al. be withdrawn.

Applicants thank the Examiner for the indication that SEQ ID Nos. 1 and 2 are free of the art of record. Accordingly, new claims 31 and 32 directed to those sequences are submitted with this response.

Applicants submit that the present application is now in condition for allowance. Favorable reconsideration and action in view of the forgoing amendments and remarks is earnestly requested.

Date: 11/15/2005

Respectfully submitted,

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